REMARKS

The Office Action rejected claims 3 and 14 for failing to comply with 35 USC 112 paragraph 2. These claims have been amended to correct the noted errors.

The Office Action rejected claims 29-30 on grounds of double patenting over Duncan et al. (U.S. Pat. 6,621.417). Enclosed is a terminal disclaimer to overcome that rejection.

The Office Action rejected claims 1-19, 25-26, 28-30, and 32-34 as being directed to an invention that would have been obvious to one of ordinary skill in the art from the disclosure of Stump et al. (U.S. Pat. 5,819,859) in view of the disclosure of Bashforth et al. (U.S. Pat. 5,499,029). These rejections are respectfully traversed.

As defined in claim 1, applicant's invention provides a system for the automatic detection and identification of hidden aboveground fixed utility objects, which includes at least one transponder located above ground. The transponder is capable of being tagged to at least one utility object. This provides radio frequency communication with an radio frequency (RF) scanner/receiver that communicates with a control head. The RF scanner/receiver and control head are being powered directly by a power source.

The transponder includes a radio frequency identification (RFID) transponder. The RFID transponder transmits information identifying and/or relating to the location of the hidden object. The RF scanner/receiver includes an antenna and an RF interrogator. The control head includes a microprocessor and a user interface for automatically communicating the identification of the object. The RF scanner/receiver and the control head are removably mounted on a mobile machine.

The operator of the machine is provided with an alert about the identity and location of the object adequate to permit avoidance of a collision with a hidden object. This does not require user interpretation of oscilloscope traces or the like when the machine comes into proximity with a transponder, allowing the operator of the machine time to react to avoid the object.

This system differs from the prior art because the system rapidly and autonomously detects and unambiguously identifies hidden aboveground fixed utility objects. Also, the system alerts the operator of any transponders without any additional human interpretation. Further, the system includes a control head with a user interface. Lastly, the RF scanner/receiver and the control head are removably mounted on a mobile machine.

Applicant's invention provides a method for locating, servicing, and/or troubleshooting hidden aboveground utility objects involving several steps. First is tagging the hidden utility objects with programmable passive RFID transponders. Second is operating a vehicle for locating, servicing, and/or troubleshooting the utility object fitted with an RF transponder detection system. Third is decreasing the forward progress of the vehicle when an alert is observed. Fourth is locating the tagged utility object. Fifth is avoiding the tagged utility object.

This claim differs from the prior art because the method is specifically for locating, servicing and troubleshooting hidden <u>aboveground</u> objects.

Stump et al. (U.S. Pat. 5,819,859) discloses a system/method for detecting the presence and location of an <u>underground</u> structure (22). The system includes a probing and detection unit (PDU) (28) located above ground but looking below ground and a below ground non-programmable (dumb) target (20) mounted on an underground structure (22). Therefore, the PDU must aim its radiation into the ground and look for signals from the ground. Radio frequency communication occurs between radio frequency scanner/receiver (54, 56) that also communicates with a probing and detection unit (28). The PDU (28) using a ground penetrating radar system (col. 21 lines 11-12) transmits a probe signal (36) to the dumb target (20). The target generates a signal and responds with a signature signal (38). The RF scanner/receiver (54, 56) includes at least one antenna and a detector. The probing and detection unit includes at least one microprocessor (60).

Bashforth et al. (U.S. Pat. 5,499,029) discloses a wide band stepped or varying frequency ground penetrating radar. Again, Bashforth et al. is looking <u>into the ground</u> not above ground. Bashforth et al. discloses that an operator can retrieve information about a target buried beneath the ground, such as presence, size, depth, distance and target characteristics. Bashforth et al. displays waveforms, requiring further interpretation by the operator (Figure 3 and 4). Bashforth et al. does not provide an alert to avoid an object buried under the ground. Also, Bashforth et al. teaches and relies on a wide-band, stepped-frequency ground penetrating radar where a target communicates with a ground penetrating radar system from 100 MHz to 1000 MHz and data is taken at 451 frequencies through 900 MHz at 2.0 MHz step intervals. The method of analysis Bashforth uses to determine where the target is requires data that is the result of starting with the stepped frequencies.

The subject matter of Claims 1-19, 25-26, 28-30, and 32-34 would not have been obvious to one of ordinary skill in the art from Stump et al. (U.S. Pat. 5,819,859) in view of Bashforth et al. (U.S. Pat. 5,499,029).

There is no motivation to combine Stump et al. with Bashforth et al. Stump et al. discloses a probing and detection unit using a ground penetrating radar to detect a target. The target transmits a signature signal to Stump's PDU. However, Bashforth et al. discloses a wide band stepped frequency ground penetrating radar where data is taken at 451 frequencies through 900 MHz at 2.0 step intervals to obtain the location of an object. The signal in Bashforth et al. is not distinguished from other clutter and is non-signature. Specifically, one of ordinary skill in the art at the time the invention was made would have no motivation to combine Stump et al. with Bashforth et al. Their methodologies are too diverse. Even if such an combination had been attempted, the present invention would not have been the result, since it looks for above-ground items, not buried items, and achieves a level of detection reliability vastly beyond the capabilities claimed by Stump et al. or Bashforth et al.

It would not have been obvious to one of ordinary skill in the art at the time the invention was made that a RF scanner/receiver and control head could be removably mounted on a mobile machine based on Stump et al. as claim in claim 1. Further, it would not have been obvious to one of ordinary skill in the art at the time the invention was made to use the interface disclosed in Bashforth et al. in the system disclosed in Stump et al. to make the apparatus and method for detecting an underground structure more effective. Also, it would not have been obvious to one of ordinary skill in the art at the time the invention was made to use the system described in Stump et al. to detect aboveground objects. Lastly, Stump et al. and Bashforth et al. fail to disclose applicants fast reacting system that provides the operator with a rapid alert.

The wheels in Stump et al. do not make the device removably mounted on a mobile machine. Stump et al. fails to achieve the structural features or good results of applicant's invention. Specifically, the PDU in Stump et al. is moved with the wheels affixed to the device. Nothing in Stump et al. discloses or supports removal. However, claim 1 recites that the device is <u>removably mounted.</u> The device can be removed from one machine and mounted on another after use.

The office action suggests that Bashforth et al.'s "user interface" meets applicant's claim. In contrast to Bashforth et al., applicant provides an output to the user interface that does not require significant interpretation or examination by the operator. This aspect of the invention allows for a more rapid response time and eliminates the burden on the machine operator to constantly interpret data allowing him to concentrate on his primary task of safely operating the machine. The user interface in Bashforth et al. only can produce physical information in the form of waveforms derived from examination of the object by radio frequencies.

Bashforth et al. does not teach that the user interface can indicate the direction of the target, nor the use of a transponder as a target. The Office Action incorrectly states that the <u>target</u> disclosed in Bashforth et al. is a <u>transponder</u>. Applicants' preferred transponder is programmable, encoded with information, such as unique identifier, object type, etc. However, Bashforth et al. does not disclose a transponder at all. It simply mentions target 54, which is some underground formation detectable by ground penetrating radar. No programmable and encoded transponder is disclosed by either Bashforth et al. or Stump et al. Applicants' invention functions with no uncertainty as to the identity of an object, down to its serial number. Further, applicants user interface can display the direction of a hidden object and can display non-detectable characteristics of the object encoded by the transponder. Thus, applicants' user interface is distinguishable over the combined user interface of Stump et al. and Bashforth et al.

Further, the hypothetical system the office action describes using the Bashforth et al. user interface on the Stump et al. system fails to amount to the structural features of applicants invention. Applicant uses a user interface to locate and alert the user about <u>aboveground objects</u>. The hypothetical combination of Stump and Bashforth would be using a ground-penetrating radar to locate <u>underground objects</u> and would provide a read out on the user interface of waveforms containing backscatter. Further, the hypothetical system has no value. A ground-penetrating radar traveling over the surface of the earth on wheels does not need an alert to avoid colliding with an object buried underground.

<u>Regarding claim 2,</u>

It would not have been obvious to a person having ordinary skill in the art at the time the invention was made that a system would provide a user with a two second response time before physically contacting a utility object to avoid a collision. Most importantly, there is no reason for the aboveground probing and detection unit disclosed in Stump et al. to avoid a collision with an object buried under the earth. Further, Stump et al. does not provide a user interface to notify a user of a detected object; the invention only locates objects. In addition, the user interface disclosed in Bashforth et al. only provides waveforms to detect objects and requires additional interpretation by the user. Thus, applicants' inventions two-second response time is not obvious.

Regarding claim 4

It would not have been obvious to a person having ordinary skill in the art that an RFID can be operated at a frequency band of 915 MHz as claimed in claim 4. Most notably, Stump et al. and Bashforth et al. use ground penetrating radio frequencies. Stump et al. uses 100 MHz to signal his target (see col. 8, line 9). Bashforth et al. uses and relies on varying frequencies to detect untagged objects. Again, the Office Action incorrectly refers to the target in Bashforth et al. as a transponder. Applicants' invention teaches the use of a single frequency that can be selected from a broad range of frequencies to optimize speed and reliability of aboveground object detection, with 915 MHz being preferred because it provides the best penetration of the medium (air and foliage, not ground) and allows for smaller antenna geometry. Further, applicants' use of a single frequency of 915 MHz permits compliance with FCC regulations for readily available RFID components. In contrast, Stump is silent about the consideration of regulatory compliance and antenna geometry.

Regarding claim 6-7, 10-13,

It would not have been obvious to a person having ordinary skill in the art to use a microwave antennae or an array of antennae. There is no suggestion in Stump et al. or Bashforth et al. to use multiple antennae. Specifically, Bashforth et al. fails to disclose any specific types of antennae for use. Further, none of the antennae applicant discloses in claims 5-13 are suggested in Stump et al. Additionally, applicants antennae are functioning to

communicate with a transponder using RFID technology, which is not disclosed by Stump et al. or Bashforth et al.

Regarding claims 29 and 30,

Even if, using hindsight, Stump et al. and Bashforth et al. were combined, the features of claims 29 and 30 would not be the result. Neither reference says to use programmable passive RFID transponders. Neither reference says to operate a vehicle for locating, servicing, and/or troubleshooting hidden aboveground utility objects. Neither reference says to decrease the forward progress of a vehicle when an alert is observed. Thus, claims 29 is distinguishable over the prior art. Also, the references say nothing about programming an RFID transponder, so claim 30 has a further distinguishing feature.

Regarding Claims 20-22 and 34-37

The Office Action rejected claims 20-22 and 34-37 as being directed to an invention that would have been obvious to one of ordinary skill in the art from the disclosure of Stump et al. (U.S. Pat. 5,819,859) in view of the disclosure of Bashforth et al. (U.S. Pat. 5,499,029), and further in view of Zimmermann et al. (U.S. Pat. 3,836,842). These rejections are respectfully traversed.

Zimmermann et al. (U.S. Pat. 3,836,842) discloses a marking device magnetically responsive to interrogatories and an apparatus for recognizing the presence of such marking devices (col. 1, lines 6-9). Zimmermann teaches a marking device (1) placed adjacent the facilities and provides a satisfactory detectable upon the operating of an interrogating instrument. The interrogating instrument includes a loud speaker (39) that sounds an audible alarm when the presence of the marking device is detected. Also, Zimmermann teaches a visible sensory alarm (61).

It would not have been obvious to a person having ordinary skill in the art to use the loud speaker taught by Zimmermann et al. in the system disclosed by Bashforth et al and/or Stump et al. There is no motivation to combine the elements. Is one to apply Bashforth's waveform to the speaker and get a nonsensical noise? Neither Bashforth nor Stump says anything about alarm conditions: nothing is "alarming" and there is not discrete event to send to the alarm

In addition, Zimmermann et al. in view of Stump et al. and Bashforth et al. fail to achieve applicants' invention. The combination of Zimmerman et al., Stump et al. and Bashforth et al. fail to disclose an alert with a visual and audible sensory alarm on a user interface. Thus, claim 20-22 and 35-37 are distinguishable over the prior art.

Regarding Claim 23

The Office Action rejected claim 23 as being directed to an invention that would have been obvious to one of ordinary skill in the art from the disclosure of Stump et al. (U.S. Pat. 5,819,859) in view of the disclosure of Bashforth et al. (U.S. Pat. 5,499,029), and further in view of Parkinson et al. (U.S. Pat. 5,430,379). These rejections are respectfully traversed.

Parkinson et al. (U.S. Pat. 5,430,379) discloses an adapter used to locate conductors underground. Parkinson teaches a knob having five settings; one setting being a battery test setting that would activate an audible alarm if the battery were low.

It would not have been obvious to a person having ordinary skill in the art at the time the invention was made to use the battery setting taught by Parkinson et al. on the system disclosed in Stump et al. There is no motivation to combine. Parkinson et al. discloses an adapter used to locate underground conductors and detects objects through electrically conducted energy. However, Stump et al. and Bashforth et al. use RF signals to detect underground objects. There are substantial technological differences between using electrically conducted energy and RF signals to detect underground objects. One of ordinary skill in the art at the time the invention was made would not have the motivation to combine Parkinson et al. with Stump et al. in view of Bashforth et al.

In addition, Parkinson et al. in view of Stump et al. and Bashforth et al. fail to achieve applicant's system test switch on a user interface rather than on a knob. The combination of Parkinson et al. and Stump et al. fails to disclose a user interface with a test switch. Thus, claim 23 is distinguishable over the prior art.

Regarding Claim 24

The Office Action rejected claim 24 as being directed to an invention that would have been obvious to one of ordinary skill in the art from the disclosure of Stump et al. (U.S. Pat.

5,819,859) in view of the disclosure of Bashforth et al. (U.S. Pat. 5,499,029), and further in view of Ulrich (U.S. Pat. 3,916,298). These rejections are respectfully traversed.

Ulrich (U.S. Pat. 3,916,298) discloses a system for detecting buried electrically conductive objects. Ulrich teaches a reset switch (66) for resetting an audible alarm (70) for an immediately detected object.

For the reasons set forth above concerning claim 1. Claim 24 is distinguishable over the prior art.

<u>Regarding Claim 27 and 31</u>

The Office Action rejected claims 27 and 31 as being directed to an invention that would have been obvious to one of ordinary skill in the art from the disclosure of Stump et al. (U.S. Pat. 5,819,859) in view of the disclosure of Bashforth et al. (U.S. Pat. 5,499,029), and further in view of Archambeault et al. (U.S. Pat. 5,469,155). These rejections are respectfully traversed.

Archambeault et al. (U.S. Pat. 5,469,155) discloses a wireless transmitter that transmits information about a boring head from a boring head location to the initial device where the boring device is controlled. Archambeault teaches the use of one-way wireless communication by using a wireless communicator (26) containing an antenna (28) that transmits an information signal to a remote receiver (32).

It would not have been obvious to a person having ordinary skill in the art at the time the invention was made to use a wireless communicator for transmitting information signals to a distant database. There is no motivation to combine. Archambeault et al. specifically transmits information wirelessly between a boring head location to the initial device where the boring device is controlled. Archambeault et al. does not use a ground penetrating radar to transmit information. Most importantly, Archambeault et al. only uses one-way wireless communication as opposed to two-way wireless communication disclosed in Stump et al. and Bashforth et al. Thus, one of ordinary skill in the art at the time the invention was made would not have the motivation to combine Archambeault et al. with Stump et al. in view of Bashforth et al.

In addition, Archambeault et al. in view of Stump et al. and Bashforth et al. fail to achieve applicants invention. The combination of Archambeault et al., Stump et al. and

Bashforth et al. fail to disclose a wireless communicator that transmits information signals to a distant database. Applicants invention provides wireless communication between a distant database and applicants system. The information can be collected and distributed to a database anywhere in the world. Most importantly, the signal generation that occurs in Archambeault et al. takes place at the boaring head device. Rather, applicants signal generation occurs at the transponder detection system. Thus, claims 27 and 31 are distinguishable over the prior art.

Regarding claim 16-18, 25, 26, 28, 32, 33

These claims are distinguishable over the prior art for the reasons set forth above concerning claim 1.

New Claims 38-53

New claims 38-53 are being presented. Claim 38 and its dependents recite that the antenna is arranged to broadcast a signal toward locations above the ground – quite different than Stump and Bashforth's subterranean aims. Claim 39 recites a database operatively associated with the microprocessor and storing data about RFID transponders – something Stump and Bashforth don't do.

Claim 40 recites a GPS system to determine a geographic location of the RFID transponder detection system and operatively associated with the microprocessor to compare such determined location with a location of a detected RFID transponder. Claim 41 recites that location of a detected RFID transponder is stored in a database. And claim 42 recites that the location of a detected RFID transponder is transmitted by the RFID transponder. Stump and Bashforth don't do that.

Claim 43 recites a method of assisting in the location of hidden aboveground objects comprising marketing programmable RFID transponders that are adapted for installation on outdoor, above-ground items and that include unique identifiers, storing the unique identifiers in a database, and making copies of the database available to users of a RFID transponder detection system for the detection of above-ground objects on which the RFID transponders may be mounted. Stump and Bashforth don't do that, either.

Claims 44 and 45 set forth methods that include applying a tag with a programmed passive RFID transponder to the object above the ground; Stump and Bashforth are concerned with underground matters and would not suggest such a step to those of ordinary skill.

Claim 46 recites detecting and identifying an object fully automatically, autonomously, and positively. Bashforth requires study of his waveform to interpret his results, and applicant's programmed RFID transponder identification gives the positive identification.

Claim 47 recites that the motion or action of a piece of heavy machinery is stopped at detection of an RFID transponder. Bashforth and Stump don't do that.

Claims 48 and 49 recite that the identification of an object is aided by position data derived from locally provided data from other RFID transponders or by a separate radio navigation signal. Bashforth and Stump don't do that.

Claims 50-51 recite an outdoor, above-ground utility installation object selected from the group consisting of Object Types, Telephone Pedestal, Fiber Optic Junction, Water Hydrant, Gas Valve, Power Transformer, Guy Wire, Cable anchors, Power Pole, Telephone Pole, Boundary Marker, Survey Control Point, Fence, River/Stream, Metal Tower, Road/Highway, and an RFID transponder attached to the object that includes a unique identifier for the object. Bashforth and Stump are concerned with underground formations, not the above-ground items recited in this claim.

Claim 52 recites a vehicle on which the RFID transponder detection system is mounted,

where the detection system provides an output signal for automatically stopping the vehicle. Bashforth and Stump are concerned with underground formations, and would have no need to avoid above ground objects.

Claim 53 recites a method that includes generating an output signal for automatically stopping the vehicle. Stump and Bashforth don't do that.

Accordingly, this application is now in condition for allowance, and such is respectfully requested. If the examiner has any further small matters requiring discussion, he is encouraged to telephone the undersigned for expeditious handling.

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PATENT & TRADEMARK OFFICE

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